REMARKS

Claims 1-25, 29-53, and 55-58 are now pending in the application, of which claims 23-25 and 28-53 are currently withdrawn from consideration. Applicants also submit a declaration by inventor Gayatri (Vyas) Dadheech under 37 C.F.R. 1.132 in support of this response. The Examiner is respectfully requested to reconsider and withdraw the rejection in view of the declaration and the remarks contained herein.

REJECTION UNDER 35 U.S.C. § 103

Claims 1-3, 13-15, 18-22 and 55-58 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Li et al. (U.S. Pat. No. 5,624,769) in view of Gordon (U.S. Pat. No. 4,146,657). Claims 1-2 and 55-57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gyoten et al. (U.S. Pat. No. 7,005,205) in view of Gordon (U.S. Pat. No. 4,146,657). Claims 4 – 12 and 16 – 17 are rejected under 37 U.S.C. 103(a) as being unpatentable over Li et al. (U.S. Pat. No. 5,624,769) in view of Gordon (U.S. Pat. No. 4,146,657) as applied to claim 1 above, and further in view of Applicant's Admitted Prior Art (heretofore 'the AAPA'). These rejections are respectfully traversed.

Claims 1 and 55 are independent claims from which all other rejected claims depend. The Examiner has rejected claims 1 and 55 on the grounds that it would be obvious to combine the teachings of Gordon with both Li et al. and Gyoten et al. In response to the previous two Office Actions dated April 13, 2007 and August 27, 2007,

Applicants argued that it is improper to combine Gordon with either Li et al. and Gyoten et al.

In particular, Applicants argued that the applications to which Gordon is directed are not reasonably pertinent to the fuel cells of Applicants' invention and that, in any case, Applicants use of doped tin oxides was contrary to the conventional wisdom regarding metallic oxides, including tin oxides, and the prevailing approach for their use in fuel cell designs. As a result, Applicants developed a bipolar plate assembly that includes a doped metal oxide topcoat layer that does not merely perform the same function as the layer disclosed by Gordon and produces results unexpected of a tin oxide layer used in a fuel cell.

In the current Office Action, the Examiner has acknowledged, but not accepted, Applicants' assertion that Gordon is not reasonably pertinent to Li et al. and Gyoten et al. Applicants believe that the Examiner has overlooked Applicants' rebuttal evidence concerning the Examiner's *prima facie* arguments of obviousness and motivation to combine the teachings of Gordon to Li et al. and Gordon et al. In support of its position, Applicants submit a declaration by joint inventor Gayatri (Vyas) Dadheech under 37 C.F.R. 1.132 (hereinafter "Vyas Declaration") further rebut the Examiner's *prima facie* arguments of obviousness. Applicants respectfully request that the Examiner reconsider his obviousness rejection in view of the entire record, including prior arguments made by Applicants. (M.P.E.P. § 2145).

The bases for the Examiner's obviousness rejection and Applicants response is set forth below.

1. Examiner: *"Gordon directly teaches that such specific oxide films find application in electrochemical systems or environments due to their high electrical conductivity and suitable thermal expansion coefficient."* (OA 11-21-07, p. 7).

Applicants submit that Gordon's teachings are directed to the use of specific oxide films in photo cells or other optical-electronic devices but not more broadly to use in the electro-chemical systems of fuel cells or similar environments. Rather, Gordon teaches that "[s]uch layers are useful as transparent electrodes for solar photovoltaic cells, photoconductive cells, liquid crystal electro-optical displays, photoelectrochemical cells, and many other types of optical-electronic devices." (Col.1, lines 11-15). Gordon also discloses that the objects of his invention include providing "improved articles such as solar cells, other semiconductors useful in electrical circuitry, heat-reflective windows, improved sodium lamps and the like" and permitting "deposition of such layers with standard manufacturing processes in the semiconductor industry and glass industry." (Col. 2, line 63 to Col. 3, line 2). None of the applications or objects disclosed by Gordon include fuel cells or involve the caustic environment of a PEM fuel cell. (Vyas Decl., Para. 7). Moreover, the advantages disclosed by Gordon (e.g., transparency, high electrical conductivity, and thermal expansion coefficient) would not commend themselves to the attention of one skilled in the art of fuel cells without the express disclosure of or general knowledge that the tin oxides disclosed by Gordon would find application in fuel cells. Un-doped tin oxides, like other metal oxides, are commonly known to be unstable in the fuel cell environment. (Vyas Decl., Para. 8, 13, 15). In light of the omissions in Gordon and the general knowledge of skilled artisans concerning tin oxide, Applicants submit that Gordon does not teach, either directly or otherwise, that doped tin oxides find application in fuel cells.

2. Examiner: *"Additionally, the teachings of Gordon and Li et al. are fully pertinent to one another and the field of applicant's endeavor because Gordon is strictly concerned with providing a suitable electrically conductive layer to reduce electrical resistance in power generating devices such as a solar cell or in electrical devices."* (OA 11-21-07, p. 7).

The Examiner misconstrues the nature of the problem confronted by Applicants and thereby arrives at the wrong conclusion regarding the pertinence of Gordon to fuel cell design. The problem confronted by Applicants is not merely characterized as providing a conductive layer possessing high bulk electrical conductivity and a suitable thermal expansion coefficient. Importantly, the technical problem to be solved includes providing a conductive layer on a metallic substrate capable of achieving and maintaining low contact resistance on a surface adjoining the substrate and an opposite surface exposed to the environment of the fuel cell and providing anti-corrosive properties that inhibit electrical degradation of the conductive layer. (Vyas Decl., Para. 6, 17).

While Gordon may be concerned with providing a suitable electrically conductive layer to reduce electrical resistance in power generating devices such as a solar cell or in optical-electronic devices, Gordon was neither confronted with, nor is concerned with the unique technical problems presented by the caustic environment of a fuel cell. Furthermore, Gordon characterizes the conductive layers formed by his process as *highly transparent to visible light and highly reflective to infrared light* . . ." (Col. 1, lines 7-10, emphasis added). In light of the differences between the technical problems confronting Applicants and Gordon, the general knowledge of skilled artisans regarding tin oxide compositions, and the limited characteristics of the tin oxide layer disclosed by Gordon, Applicants submit that Gordon does not commend itself to the attention of one

skilled in the art of fuel cell design and thus, is not reasonably pertinent to Applicants' field of endeavor.

3. Examiner: *"Combining prior art elements according to known methods to yield predictable results is prima-facie obvious." "The predicable result is the high conductivity and good matching of thermal expansion coefficient offered by Gordon's film made of the fluorine doped tin oxide."* (OA 11-21-07, p. 14).

Most likely a result of the Examiner's misconstruing of the technical problem confronted by the Applicants, the Examiner also misconstrues the particular unexpected results that Applicants identify. The unexpected results include providing a stable (i.e., anti-corrosive) layer of tin oxide on a conductive metallic substrate used in a fuel cell that exhibits low contact resistance between the tin oxide layer, the adjoining substrate, and other adjoining surfaces of the fuel cell, such that the tin oxide layer can pass current between the tin oxide layer and the adjoining surfaces. (Vyas Decl., Para. 16, 18). As explained by Applicants in response to the previous Office Action dated August 27, 2007, that these results are unexpected of tin oxide compositions is demonstrated by the general knowledge of skilled artisans and the fact that an examination of the function of the oxide layer in Gordon does not inform the skilled artisan whether or not such compositions are capable of achieving these results.

4. Examiner: *"Use of known technique to improve similar devices in the same way is prima facie obvious." "The improvement is the high conductivity and good matching of thermal expansion coefficient offered by Gordon's film made of the fluorine doped tin oxide."* (OA 11-21-07, p. 14).

Applicants have explained the significant dissimilarities between the devices to which Gordon applied its teachings and the fuel cells of Applicants' invention and on this basis, submit that Applicants have not used the process disclosed by Gordon to improve a *similar device*. Applicants further submit that Applicants did not apply the

process disclosed by Gordon to improve the bipolar plate assembly of a fuel cell in the same way that Gordon improved optical-electronic devices. While Applicants have improved the bipolar plates of a fuel cell by providing a conductive layer of tin oxide that can pass current between the layer and the adjoining metallic substrate, Gordon neither sought, nor disclosed, a tin oxide layer that conducted current between the tin oxide layer and the underlying glass substrate. (Vyas Decl., Para. 17-18). Gordon sought an improved process for applying conductive films of tin oxide to glass substrates used in electro-optical devices having high electrical conductivity and high infrared reflectivity. To this end, Gordon discloses a doped tin metal oxide layer on a heated glass substrate that is used to pass current in a solar cell, however the metal oxide layer disclosed by Gordon passes current within the layer and not between the layer and the substrate. Thus, Applicants submit that the process disclosed by Gordon was not applied to improve the bipolar plate assembly of a fuel cell in the *same way* that Gordon improved optical-electronic devices.

5. Examiner: *"As disclosed in the Gordon reference, the fluorine-doped tin oxide film (coating) exhibits good electrical conductivity and good match of thermal expansion coefficient. Thus, the motivation for the combination would be to increase conductivity and better match thermal expansion coefficient."* (OA 11-21-07, p. 15).

Applicants have argued that Gordon would not have commended itself to the attention of the skilled artisan and further submit that one skilled in the art of fuel cells would not be motivated to combine the teachings of Gordon with Li et al. or Gyoten et al. As evidenced by Li et al. and Gyoten et al., the prior art teaches away from the use of metallic oxides alone in the conductive elements of the fuel cell. (Vyas Decl., Para. 9-12). The prior art teaches applying other non-metallic oxide coatings to the substrate

or passivating layers of the bi-polar plate, such as TiN, as in Li et al., and electroconductive resin layers, as in Gyoten et al., to prevent, or at least inhibit the formation of metallic oxide films. (Vyas Decl., Para. 16).

Additionally, Applicants' decision to experiment with tin oxide compositions was contrary to the conventional wisdom regarding the applicability of tin oxide in fuel cells. Specifically, the conventional wisdom includes knowledge that un-doped tin oxide is unstable in the presence of the reducing gases (e.g., hydrogen) and the perfluorinated sulfuric acid present in the environment of the fuel cell and tends to form localized surface deposits of resistive tin oxide. (Vyas Decl., Para. 14).

In sum, Applicants have offered evidence and argument to rebut the Examiner's assertion of *prima facie* obviousness. Applicants have further provided additional argument that a motivation to combine the aforementioned references cannot be found in the teachings of the cited references, the conventional wisdom of one skilled in the art, or the prevailing approach of the prior art.

Based on the foregoing in addition to their other arguments of record, Applicants respectfully submit that the Examiner's *prima facie* case of obviousness has been properly rebutted and that claims 1 and 55 are allowable over the combination of either Li et al. or Gyoten et al. with Gordon. The remaining rejected claims all depend from either claims 1 or 55 and are therefore allowable for at least the same reasons. Accordingly, reconsideration and withdrawal of the Examiner's rejections of claims 1-22 and 55-58.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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